

Case Study: Triveni Turbines' Power Solutions Driving Steel Industry's Growth

Recognizing the critical role of energy efficiency in steel production, Triveni Turbines has developed specialized power systems tailored to meet the unique requirements of steel-making enterprises.

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The steel industry is notably one of the energy-intensive industries across the globe. According to a study by the International Energy Agency (IEA), the steel industry alone accounted for 8% of global energy consumption in 2023. It is observed that the energy consumption in most of the integrated steel plants in India is generally high at 6-6.5 Giga Calorie per ton of crude steel as compared to 4.5-5.0 in steel plants abroad, as per the inputs from the Ministry of Steel.

Recent government statistics reveal that in 2022-23, India's total electricity consumption jumped to approximately 1403.40 billion units (BU), of which 42% from Industrial, from 1316.76 billion units (BU) in 2021-22. The per capita energy use increased to 1327 kWh, underscoring a growing demand for energy nationwide but lower compared to the international average of around 3,577 kWh for 2022.

Traditionally, coal has been the primary energy source for the Indian steel industry, contributing substantially to its carbon emissions. In fact, during the fiscal year 2021-22, the sector emitted around 297 million tons of CO₂, highlighting the urgent need for decarbonisation initiatives. To align with the national goal of achieving net-zero carbon emissions by 2050, the Indian steel industry must implement a range of decarbonisation strategies, including alternating fuels (AFs) and adopting Carbon Capture Utilization and Storage (CCUS) technologies.

In light of this, it becomes crucial to explore efficient power generation methods to maintain sustainable operations. Companies are now moving towards green hydrogen and other renewable sources to reduce carbon output and achieve sustainability objectives. Triveni Turbines, a leading provider of efficient and sustainable power solution provider, plays a pivotal role across various sectors, including the steel industry, which has high energy demands and challenges in terms of durability and efficiency

among other industries. Recognizing the critical role of energy efficiency in steel production, Triveni Turbines has developed specialized power systems tailored to meet the unique requirements of steel-making enterprises.

Triveni's Contribution towards the Steel Industry

Steel mills often cause significant load fluctuations due to the frequent switching on and off of furnaces, which can destabilize power grids and compromise the quality of electricity supply. A consistent electricity supply is crucial for any steel or metallurgical facility. Captive power generation is essential for an iron-making factory to operate continuously throughout the year. Industry estimates suggest that an average steel plant with a production capacity of 0.5 MTPA (million tons per annum) of steel or TMT rods requires approximately 50 MW of electricity. An integrated steel plant operating a captive power plant requires 10,000 kW of electricity to run a 350 ton per day (TPD) Direct Reduced Iron (DRI) or sponge iron plant, a 15 ton induction furnace and a rolling mill with an annual capacity of one lakh tons. The final product from this process is TMT steel rods. Interestingly, the waste heat from the 350 TPD DRI plant could be utilized to generate 10,000 kW of electricity, fully meeting the captive power requirements of the integrated steel plant.

For more than five decades, Triveni Turbines has been providing the steel industry with waste heat recovery (WHR) based captive power generation solutions. With the installation of more than 150 steam turbines, our customer in the sponge iron and steel sector is able to run their business profitably in terms of both CAPEX and OPEX.

The Impact

One such example is the partnership between Triveni Turbines and Zarmen Group, a leading steel producer in Europe. Zarmen Group faced the challenge of variable power demands stemming from fluctuating steel production levels and needed a power solution that requires both flexible and reliable. Additionally, they required adherence to European Standards and Polish Grid Code specifications. Triveni Turbines responded by designing and implementing a 30 MW extraction condensing steam turbine system, which could adapt fluidly to the changing needs of Zarmen Group while complying with European grid regulations. This resulted in a robust power generation infrastructure that not only bolstered Zarmen Group's operational capabilities but also advanced its long-term sustainability objectives.

Triveni's Steam Turbines for the Steel Industry

Steel manufacturing processes usually generate significant amounts of waste heat. Steam turbines play a pivotal role in harnessing this waste heat and converting it into usable power, ultimately reducing reliance on conventional energy sources and minimizing environmental impact.

Among companies generating sub-100 MW steam turbine generator (STG) market, Triveni Turbines differentiates itself with its high-speed axial exhaust turbines. These turbines enabled a leading South Korean steel producer to create 113 MW (with 1 No of 41 MW and 2 No's of 36 MW) power while also supplying process steam. With captive power generation systems for steel manufacturing, co-generation plants or waste heat recovery units, Triveni Turbines STGs offer seamless integration into various processes involved in making steel products. The waste heat that is recovered using our steam turbines can seamlessly integrate into steel making processes thereby reducing the carbon footprint while improving the environmental friendliness associated with such facilities that are powered using fossil fuels.

Triveni REFURB: Improving Efficiency in the Steel Industry

Triveni Turbines recognizes the importance of maintaining and enhancing the life and efficiency of steam turbine systems. This has led to the development of Triveni REFURB, a comprehensive renovation program aimed at updating older turbines to meet current operational standards and extend their service life.

As steam turbines age or are subjected to prolonged use, they can degrade, leading to diminished efficiency. Factors such as changes in operational demands, industry regulations, and technological advancements necessitate the refurbishment of these turbines to maintain optimal performance levels. Triveni REFURB addresses these needs by offering customized solutions for upgrading existing turbine systems, ensuring modifications are specifically tailored to meet diverse requirements. This approach not only saves money by reusing components such as casings and civil foundations, which require only minor adjustments, but also leverages existing infrastructure to ensure a seamless and cost-effective refurbishment process thereby causing minimal disruption to the plant operation.

In Essence

Triveni Turbines is widely recognized as a dependable partner in the steel industry, known for delivering sustainable energy solutions through consistently demonstrating innovation, reliability, and a customer-focused approach in their steam turbine technology. The company has established a track record of successful installations world-wide and continually seeks to enhance the quality and efficiency in addressing the steel sector's challenges. Since its inception, Triveni Turbines has enabled steel manufacturers to reduce costs by enhancing the operational efficiency through technological innovations and expertise. The company is actively involved in every project phase, from design to implementation, and by the commitment to environmental sustainability. Triveni Turbines collaborates with various stakeholders, including governmental and non-governmental organizations to promote awareness of renewable practices among industrial entities, informing them about the necessary changes to better our environment.

- Triveni Turbines

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